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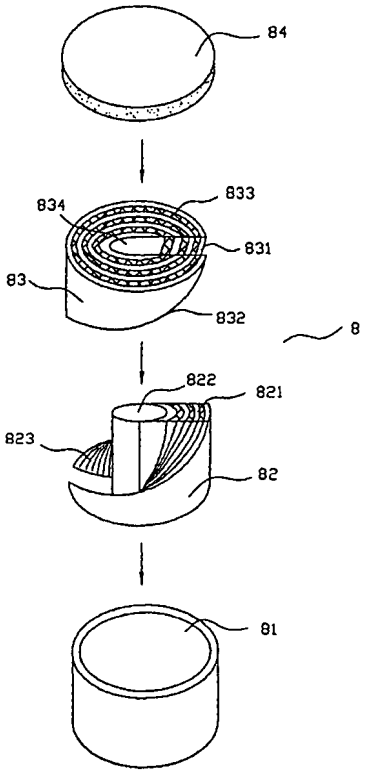
(54) Title: AN INTEGRATED CONTACT FOR POWER SWITCHGEAR



(57) Abstract: An integrated contact for power switchgear, its arc proof component, magnetic field generating component and conductive component are set in a open container. Conductive component and magnetic field generating component are mutually combined and set at bottom of the container, arc proof component is set on top of the combination of conductive component and magnetic field generating component. Conductive component passes through center of the container, and from top to down, it equally divides the container; magnetic field generating component is isolated by conductive component and set at other part of the container. Contact surface of the invention has multiple pole axial magnetic field, the contact is suitable used for integrated contact for interrupting high volume current in arc extinguished chamber of vacuum interrupter. The invention belongs to electrical equipment field.

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An Integrated Contact for Power Switchgear

Field of the invention

The present invention relates to a structure of integrated contact for power switchgear, especially a structure of integrated contact in arc extinguished chamber of vacuum interrupter. It belongs to electrical equipment field.

Background of the invention

Switchgear is an essential equipment in circuit which plays switching on and switching off function in the circuit. While switching off, switchgear has very high resistance in order to withstand certain voltage; While switching on state, it must have very low resistance in order to pass rated current without overheat. During switchgear contacts interrupting, arc extinguishing is necessary to make contacts to be quickly separated. At present, there are different kinds of arc extinguishing medium: oil, sulphur hexafluride(SF_6), air, semiconductor and vacuum etc. Different arc extinguishing mediums correspond to different interrupter structure and with different properties. As vacuum interrupter has small gap, high withstand voltage, low arc voltage, high current interrupting capability, low electrode erosion and high electric life, so it is broadly used in power line under 35KV voltage. As shown in Fig. 1, the heart of a vacuum interrupter 7 is its vacuum arc extinguished chamber 6 within envelope 5. The properties of contacts 1 and 2 within vacuum arc extinguished chamber 6 determines properties of vacuum interrupter 7 directly. The rear of contacts 1 and 2 of vacuum interrupter 7 is connected to moving electrode 3 and stationary electrode 4, respectively, interruption of contacts 1 and 2 is mechanically operated by moving electrode 3. During interruption, contact area of contacts 1 and 2 is getting smaller until there is only one contact point between contacts 1 and 2. At the same time, contact resistance and area temperature are increased until the contact point is melted, vaporized and ionized. Metal vapor keeps discharge procedure to be continued in vacuum and produces vacuum arc, finally contacts are electrically interrupted. In order to raise interrupting capability of vacuum interrupter, it is necessary to provide vacuum arc with axial magnetic field, which maintains vacuum arc at a stable and dispersive state. In this way, current will be well distributed on contact surface, temperature on contact surface will be decreased and amount of vaporization of contact material is avoided, all of these maintaining arc voltage at a lower level and decreasing electrical erosion of contact. Therefore, contacts in arc extinguished chamber of vacuum interrupter must have abilities of burning arc, conducting electrically and producing magnetic field. Its technical parameters need to satisfy following requirements: excellent anti-welding characteristics, excellent voltage withstanding characteristics, high current-interrupting capability, excellent anti-electric erosion characteristics, low current chopping characteristics, low air content, high conductivity, small geometric size and high reliability etc. At present, the contact is consisted of arc proof component, conductive component and magnetic field generating component. As shown in Fig. 2, the arc proof component 11 is set in

the middle part and is consisted of copper-chromium (CuCr) material, which has large current interrupting capability and excellent anti-welding characteristics and produces metal vapor during interrupting time to maintain current. The conductive component 12 is a round contact body and generally consisted of copper material. The magnetic field generating component 13 is an inductance coil and set outside of the contact body; whether at an axial magnetic field or at a radius magnetic field, its magnetic field intensity is comparatively low. When assembly, it is necessary to solder in a vacuum and heating furnace with silver copper solder to combine the components together. As every component is complicated, once of soldering can only perform part of the soldering job; so during manufacturing, it is not only necessary to enter vacuum and heating furnace many times for soldering, but also exists the following problems which cause the contact electrical properties is not good enough: contact of the soldering surface is not 100%, quality of soldering surface and strength of soldering have not been guaranteed and burr on soldering surface is unavoidable etc. For reasons mentioned above, with present technology, production of vacuum interrupter not only has low ratio of final product, complicated procedure, these causing high cost, but has no ideal electrical properties as well. In addition, all components need various professional form of copper-chromium alloy materials and machining work, such as lathing and milling, of the alloy materials is complicated.

There is another product, developed by HOLEC Co., Netherlands, with present technology, its magnetic field generating component 13 discards the original coil form and substitutes it with a set of electrical iron sheet or boards 13, which is piled on CuCr arc proof component 11 of contact body and is fasten with rivet 14. Electrical iron sheet or boards 13 have different sizes of break 131, 132 and 133, magnetic field is produced by induced current in the electrical iron sheet or boards, its concrete structures are shown in Fig. 3 and 4. The piled electrical iron sheets 13 on CuCr arc proof component 11 form a ladder-shaped, when it is seen from front view; this not only simplifies the original contacts structure, but also increases the magnetic field intensity greatly. Even with this structure, it has no choice to use the soldering method in order to combine the separated conductive component 12 and electrical iron sheet or boards 13 together. As machining methods of the structure are unchanged basically, so its cost and quality still have quite a few problems. In addition, as electrical iron sheet or boards 13 are piled in plane, according to the right-handed screw law, when magnetic induce reaches the break of sheets or boards and goes up layer by layer to form an axial magnetic flux, so the magnetic resistance is comparatively high. Furthermore, as the sheet or boards 13 are piled in a ladder-shaped form, the heat conductive body is an eccentric body; this asymmetrical heat conductive body makes instant heat diffusion effect badly; which not only influences contact interrupting capability, but also makes the whole structure deforms easily.

No matter which form it is used, a very important point for present contact structure is that, without any exception, every component of it is separately made. Therefore,

manufacturing procedures are various, the quality is unstable and the properties are not good enough. This is just like separated electronic element in early days, to implement an electrical function many separated elements need to be soldered together. This not only increases working procedures and size, but also decreases reliability and properties.

Except for the increasing cost by the complicated structure and manufacturing also procedure said above, the present technology to produce the contact wasted a grate quantities of contact materials. Either as shown in Fig 2, the traditional structure, or as shown in Fig. 3 and 4, the improved structure, remaining leftover bits and pieces after manufacturing of components cannot be rationally used. So, the cost of the vacuum interrupter is increased naturally.

Summary of the invention

The main purpose of the invention is to provide an integrated contact with integrated directly assembling structure, for power switchgear. With the invention, there is no need of soldering for combining and it changes the separated setting structure of all components in present technology.

The second purpose of the invention is to provide an integrated contact with tight structure and smaller geometric size, for power switchgear.

The third purpose of the invention is to provide an integrated contact that has high intensity of magnetic field, good heat conductivity, high interrupting capacity and longer electric live, for power switchgear.

The forth purpose of the invention is to provide an integrated contact that has high intensity of magnetic field, good heat conductivity, high interrupting capacity and longer electric live, for power switchgear.

The fifth purpose of the invention is to provide an integrated contact that has no more remaining leftover bits and pieces of materials during manufacturing of components, so it saves materials greatly and decreases cost.

The sixth purpose of the invention is to provide an integrated contact for power switchgear, with components using general sections materials in market without any special sections materials.

Technical Solution

According to the present invention:

An integrated contact, comprising arc proof component, conductive component and magnetic field generating component, of power switchgear, the said arc proof

component, the said conductive component and the said magnetic field generating component are set in a container with top opened; magnetic field generating component and conductive component are mutually combined and set at bottom of the container, and arc proof component is set on top of the combination of magnetic field generating component and conductive component; combination of magnetic field generating component and conductive component produces axial magnetic field.

The said magnetic field generating component has an through oblique section from top to bottom at side facing the center of container, with magnetic path of magnetic field generating component opened by a break from top to bottom, with a through hole in middle of magnetic field generating component from top to bottom.

The said oblique section of magnetic field generating component is a top to down symmetric section along central axis of cylinder, i.e. upper cut arc of oblique section equals to lower cut arc of oblique section.

The said oblique section of magnetic field generating component is a top to down asymmetric section along central axis of cylinder, i.e. upper cut arc of oblique section does not equal to lower remain arc after cutting.

From top to down, asymmetric oblique cut section, along central axis of the said magnetic field generating component cylinder, is a triangle after cutting.

From top to down, asymmetric oblique cut section, along central axis of the said magnetic field generating component cylinder, is a trapezium after cutting.

Upper part of the said conductive component has a supporting oblique section coincides with corresponding section of magnetic field generating component.

The said magnetic field generating component can be a multi-layer cylinder structure with different diameter and is insulated between every layer, among them at least one is soft magnetic material layer.

The said multi-layer cylinder has more than one layer of soft magnetic material.

The said multi-layer cylinders are all soft magnetic material layers.

The said conductive component is a multi-layer cylinder combining structure with different diameter, at center of cylinder there is a cylinder body for inserting into central through hole of magnetic field generating component.

The said multi-layer cylinder of magnetic field generating component and multi-layer cylinder of conductive component have same layer number.

The said magnetic field generating component is a layer shape body with one layer or more than one layer.

The said conductive component is a layer shape body with one layer or more than one layer.

Layer number of the said magnetic field generating component equals to layer number of the said conductive component.

The said magnetic field generating component is a layer shape body setting on the said conductive component.

The said magnetic field generating component is a layer shape body ,the layer is sandwiched between conductive components.

The said magnetic field generating component is more than one layer.

The said conductive component and magnetic field generating component are piled layer by layer with one layer or more than one layer, each layer of conductive component combines with magnetic field generating component to define a combination shape coordinated with inner wall shape of container.

From bottom to top of the said conductive component and magnetic field generating component, each layer area of conductive component is gradually decreased, and corresponding each layer area of magnetic field generating component is gradually increased and each layer of magnetic field generating component has an through open break.

Each layer of the said magnetic field generating component has different shape of open break.

The said container can be a cup-like body of rigid material, which melting point is higher than every inside component melting point.

The said container can be made of rustless steel with melting point higher than 1100 ^{0}C.

The said arc proof component is a mixture of copper powder and chromium powder.

Ratio of the said mixture of pure copper powder and pure chromium powder can be 10:90 to 90:10.

The said pure copper powder is 80 mesh to 400 mesh and pure chromium powder is 80 mesh to 400 mesh.

The said pure copper powder is 200 mesh to 400 mesh and pure chromium powder is 200 mesh to 400 mesh.

The said pure copper powder is 325 mesh and pure chromium powder is 325 mesh.

The said arc proof component is made of sheet or board block of copper chromium alloy.

The said copper material can be substituted by silver material.

The said conductive component is made of material with electrical conduction, high magnetic resistance and heat conduction.

The said conductive component is made of copper.

Material state of the said conductive component can be powder, sheet or board, bar, tube or block.

Material state of the said magnetic field generating component can be powder, sheet or board, bar, tube or block.

The said magnetic field generating component, part or whole, is made of soft magnetic material.

The said soft magnetic material is electrical iron.

State of the said soft magnetic material can be powder, sheet or board, bar, tube or block.

Technical effects

According to analysis of technical scheme above, it is known that the invention has following advantages:

1. Technical thinking of integrated structure of the invention is all contact components are packed into a container. The meaning of this improvement is comparable with electronic circuit improved from separated element to integrated circuit. The whole-integrated structure changes thoroughly separated setting structure of present technology, it tightens geometric size, shrinks volume and increases current density.

2. It not only greatly expanses various derived combination type of magnetic field generating component and conductive component, but also makes powder materials, uncertain shape materials, can be used, as there is an external packing container. Therefore, the invention greatly expanses various general materials can be widespread used in contacts of vacuum interrupter.
3. Magnetic flux is efficiently generated, magnetic resistance is low, axial magnetic field intensity is very high and well distributed; magnetic flux comes in and goes out on contact surface many times and forms its own close loop; and it can better avoid influence of external stray magnetic fields on interrupting capability of contacts; so arc is well controlled and in a diffusion state. All of these increase interrupting capability.
4. As sections of magnetic field generating component and conductive component are mutually combined; it not only increases heat conductivity efficiency to raise interrupting capability, but also solves damage of contact body caused by deformation due to asymmetry of heat contactor in present technology, and it also saves materials, as every cut component can be combined with another corresponding component, there is almost no leftover bits and pieces during manufacturing.
5. Materials of components need not be the alloy with certain ratio of CuCr manufactured specially for contact, and need not be special shape for components, but general copper, iron and rustless steel sections in market. This makes manufacturing easy and decreases cost.
6. Structure of every component is simple and easy to process and assemble. With entering furnace once and sealing once, the whole assemble is completed with high product ratio of up to standard.
7. It need not use soldering process, this not only saves solder, but also guarantees connection reliability of components.

With drawings and embodiments, the invention is described in detail in the following.

Brief description of the attached drawings

Figure1 is schematic diagram of arc extinguished chamber basic structure of present vacuum interrupter.

Figure2 is schematic diagram of contact structure of present arc extinguished chamber.

Figure3 is schematic diagram of another contact structure of present vacuum interrupter.

Figure4 is schematic diagram of plane structure of magnetic field generating component shown in Fig. 3.

Figure5 is schematic exploded diagram of contact structure for preferred embodiment of the invention.

Figure6 is a section diagram of contact structure for preferred embodiment of the invention.

Figure7 is schematic central section diagram of contact structure for a preferred embodiment of the invention.

Figure8 is first schematic diagram of combining structure on section of contacts for magnetic field generating component and conductive component of the invention.

Figure9 is second schematic diagram of combining structure on section of contacts for magnetic field generating component and conductive component of the invention.

Figure10 is schematic diagram of conductive component structure of contact for another preferred embodiment of the invention, when the component is a whole and its shape coordinates with shape of magnetic field generating component.

Figure11 is schematic diagram of multi-layer magnetic field generating component structure of contact for another preferred embodiment of the invention, the component has one layer or more than one layer pure iron.

Figure12 is schematic diagram of layer setting combining structure of magnetic field generating component and conductive component of the invention.

Figure13 is schematic diagram of sandwich layer setting combining structure of magnetic field generating component and conductive component of the invention.

Figure14 is scenograph diagram of layer structure, with trapezium setting combining from bottom to top, of magnetic field generating component and conductive component of the invention.

Figure15 is schematic diagram of application structure with using technical scheme of the invention to the present technology shown in Fig. 3 and 4.

Preferred embodiments

The main thinking of the invention is to set contact components, which are separately set in original, into a container, which acts an external package of the contact so that the contact has a integrated whole structure. Specifically, magnetic field generating component and conductive component are mutually combined and set at bottom of the container, arc proof component is set on top of the combining of magnetic field

generating component and conductive component. Magnetic field generating component has magnetic path open break. The combining of magnetic field generating component and conductive component produces axial magnetic field. Container can be cup-like body, and its materials is rigid, melt point of that is higher than melting point of any component in the container, for example, container material can be melting point higher than 1100^0 C rustless steel. Conductive component material can be conductive, electric and heat, and high magnetic resistance. If pure copper or red copper material is used, its melting point is 1083^0 C. In order to have a melting state of conductive component in furnace, temperature of furnace must be higher than 1083^0 C. Therefore, melting point of container must be higher than 1100 ^{0} C. Part or all materials of magnetic field generating component are soft magnetic materials, for example electric iron.

As there is a container outside contact, state of arc proof component, magnetic field generating component and conductive component can be powder, sheet or board, bar, tube or block, if they can produce axial magnetic field with magnetic flux coming in and going out on contact surface.

The arc proof component 84 is made of block or plate of alloy material of pure copper and pure chromium. For further lowing cost of materials, alloy material, produced specially, of pure copper and pure chromium is no longer used for arc proof component and is substituted by mixture of general copper powder and chromium powder. According to different requirements, the ratio of copper powder and chromium powder can be varied from 10:90 to 90:10. In addition, the copper powder is preferred 325 mesh, the chromium powder is preferred 325 mesh, and the copper powder can be substituted by silver powder.

Embodiment 1, reference to Fig. 5, schematic diagram of structure of a preferred embodiment of the invention. The arc proof component 84 of contact 8, the conductive component 82 and the magnetic field generating component 83 are all set in a cup-like body 81 which has an open mouth at its top.

Magnetic field generating component 83 can be a multi-layer cylinder structure 833 with different diameter and with an insulated layer between any two layers. The multi-layer cylinder 833 can have one layer, or more than one layer or all layers of soft magnetic material, in order to produce different required intensity of magnetic field. The magnetic field generating component 83 has an through oblique section 832 from top to bottom at its side facing the center of cup-like body 81. The magnetic path of magnetic field generating component 83 is opened by the break 831 from top to bottom. At the middle of the magnetic field generating component, there is a through hole 834 from top to bottom. Distance of the break 831 of magnetic field generating component 83 can be greater than real electromagnetic physical gap between two contacts placed oppositely in the interrupter, to guarantee intensity of the axial

magnetic field between two contacts. The oblique section 832 of magnetic field generating component 83 is a top to down symmetric oblique section along the central axis of the cylinder body, i.e. upper part section arc is equal to lower part section arc. Upper part of the conductive component 82 is an supporting oblique section 823 to fix the corresponding oblique section of magnetic field generating component properly. In this embodiment, conductive component 82 is a multi-layer cylinder structure 821 with different diameter cylinder combined together; at center of cylinder 821, there is a cylinder body 822 inserting into central through hole 834 of magnetic field generating component 83.

Conductive component 82 and magnetic field generating component 83 are combined and set on the bottom of cup-like body 81, while the arc proof component 84 is set on the combination of conductive component 82 and magnetic field generating component 83. The shape of the combination of magnetic field generating component 83 and conductive component 82 has cylinder form corresponding to cup-like body 81, when combining against each other. In this way, according to right-handed screw law, while current is passed through conductive component 82, the magnetic field generating component 83 produces magnetic field and the surface of contacts has powerful magnetic flux coming in and going out.

In embodiment 1, the mutual combining section of magnetic field generating component 83 and conductive component 82 is a symmetric mean equal division structure as shown in Fig. 6 and 7. As a preferred embodiment, the shape of magnetic field generating component 83 and conductive component 82 is symmetric and coordinated. When making magnetic field generating component 83 and conductive component 82 of a contact, the remain cut is just for magnetic field generating component 83 and conductive component 82 of another contact. There is no any waste of materials and there is a better heat conductivity.

Embodiment 2, as shown in Fig. 8, it is a schematic diagram of a non-mean equal division structure of combining section of magnetic field generating component 83 and conductive component 82, said in embodiment 1 above. Along the central axis, cylinder shape body of the magnetic field generating component is sectioned obliquely and asymmetrically from top to bottom, the section is a trapezium 835. This means that, from the front view sight, area of magnetic field generating component 83 can be bigger than area of conductive component 82 to satisfy different property requirement.

Embodiment 3, as shown in Fig. 9, it is a schematic diagram of another non-mean equal division structure of combining section of magnetic field generating component 83 and conductive component 82, said in embodiment 1 above. Along central axis, the cylinder shape body of the magnetic field generating component is sectioned obliquely and asymmetrically from top to bottom, the section is a triangle 836. This

means that, from front view sight, area of magnetic field generating component 83 can be smaller than area of conductive component 82.

Embodiment 4,as shown in Fig. 10, conductive component 82, said in embodiment 1 above, is no longer a multi-layer cylinder, but a whole, which is coordinated with magnetic field generating component.

Embodiment 5, as shown in Fig. 11, it is a schematic diagram of multi-layer structure of magnetic field generating component 83 of contact of the invention with only two pure irons layers 837. Soft magnetic material layers is determined by real requirement of magnetic field intensity, the higher the intensity, the more layers required.

Embodiment 6, as shown in Fig. 12, it is a schematic diagram of layer setting combining structure for magnetic field generating component 83 and conductive component 82 of the invention. In this embodiment magnetic field generating component 83 is layer shape body set on the conductive component 82, and above it, the arc proof component 84 is set. The magnetic field generating component 83 has a magnetic path open break 838, and the shapes of conductive component 82 and magnetic field generating component 83 are mutually complemented.

Embodiment 7, as shown in Fig. 13, it is a schematic diagram of sandwich setting combining structure for magnetic field generating component 83 and conductive component 82 of the invention. Magnetic field generating component 83 is a layer shape body with magnetic path open break and is set among conductive component layers 82. This means that, at the bottom of cup-like body 81 is a layer of conductive component 82; magnetic field generating component 83 with magnetic path open break is set on the bottom layer conductive component 82; finally, arc proof component 84 is set above the top conductive component layer 82. Of course, the magnetic field generating component can be more than one layer.

Embodiment 8,as shown in Fig. 14, it is a schematic diagram of layer shape structure with trapezium setting combining relationship from bottom to top for magnetic field generating component 83 and conductive component 82 of the invention. Layers, one layer or more than one layer, of conductive component 82 and magnetic field generating component 83 are piled layer by layer. Each layer of conductive component 82 is combined with the corresponding layer of magnetic field generating component 83. From bottom to top, area of every layer of conductive component is gradually decreased and area of the corresponding layer of magnetic field generating component is gradually increased. Every layer of magnetic field generating component 83 has a open break 839 which cut off the magnetic path. Shape of the combining of the conductive component 82 and magnetic field generating component 83 is coordinated with the inner wall shape of cup-like body 81. Then, arc proof

component 84 is set on top of the combination of the conductive component 82 and magnetic field generating component 83.

The shape of the open break shape 839 of each magnetic field generating component layer 83 is different; further distance from contact surface, the larger, the open is, in order to guarantee intensity of magnetic field between contacts.

Embodiment 9, as shown in Fig. 15 and reference to Fig. 3. When the container 85 of the invention is used in the contact structure, as shown in Fig. 3 and 4, it will greatly simplify the connection of original multi layer magnetic field generating component 13. The connection is got only by directly putting layer sheet or boards into the container 85, and then melting and sintering in furnace. There is no need to rivet with rivet 14 or soldering layer by layer . This simplifies technology, decreases cost and improves product quality; the original layer sheet or board material can be substituted by powder of soft magnetic material; requirements for material are greatly lowing. It has been further described that technical thinking of the invention makes a breakthrough improvement.

Every component of the invention can be various materials with various states. For example, material of conductive component 82 can be conductive, electric and heat, and high magnetic resistance, such as copper, its state can be powder, sheet or board, bar, tube or block; material of magnetic field generating component 83 can be partly or totally soft magnetic material, such as electrical iron. Part of magnetic field generating component 83 state can be powder, sheet or board, bar, tube or block. State of soft magnetic material can be powder, sheet, bar, tube or block.

According to structure design of the invention, production process of interrupter contact can be simplified as once entering furnace and once sealing to complete whole assembly. In addition, there is no need of soldering process, it is not only save solder, but also guarantee reliability of component connection and high up standard of product.

It will be apparent to those skilled in the art that various modifications can be made to the present cell selection method without departing from the scope and spirit of the present invention. It is intended that the present invention covers modifications and variations of the systems and methods provided they fall within the scope of the claims and their equivalents. Further, it is intended that the present invention cover present and new applications of the system and methods of the present invention.

Claims

1. An integrated contact, comprising arc proof component, conductive component and magnetic field generating component, of power switchgear, the said arc proof component, the said conductive component and the said magnetic field generating component are set in a open container; magnetic field generating component and conductive component are mutually combined and set inside of the container, and arc proof component is set on top of the combination of magnetic field generating component and conductive component; combination of magnetic field generating component and conductive component produces axial magnetic field.
2. According to claim 1, where in the said integrated contact for power switchgear, the said magnetic field generating component has an through oblique section from top to bottom at side facing the center of container, with magnetic path of magnetic field generating component opened by a break from top to bottom, with a through hole in middle of magnetic field generating component from top to bottom.
3. According to claim 2, where in the said integrated contact for power switchgear, the said oblique section of magnetic field generating component is a top to down symmetric section along central axis of cylinder, i.e. upper cut arc of oblique section equals to lower cut arc of oblique section.
4. According to claim 2, where in the said integrated contact for power switchgear, the said oblique section of magnetic field generating component is a top to down asymmetric section along central axis of cylinder, i.e. upper cut arc of oblique section does not equal to lower remain arc after cutting.
5. According to claim 2, where in the said integrated contact for power switchgear, from top to down, asymmetric oblique cut section, along central axis of the said magnetic field generating component cylinder, is a triangle after cutting.
6. According to claim 2, where in the said integrated contact for power switchgear, from top to down, asymmetric oblique cut section, along central axis of the said magnetic field generating component cylinder, is a trapezium after cutting.
7. According to claim 1, where in the said integrated contact for power switchgear, upper part of the said conductive component has a supporting oblique section coincides with corresponding section of magnetic field generating component.
8. According to claim 1, where in the said integrated contact for power switchgear, the said magnetic field generating component can be a multi-layer cylinder structure with different diameter and is insulated between every layer, among them at least one is soft magnetic material layer.
9. According to claim 8, where in the said integrated contact for power switchgear, the said multi-layer cylinder has more than one layer of soft magnetic material.
10. According to claim 8, where in the said integrated contact for power switchgear, the said multi-layer cylinders are all soft magnetic material layers.
11. According to claim 1, where in the said integrated contact for power switchgear, the said conductive component is a multi-layer cylinder combining structure with

different diameter, at center of cylinder there is a cylinder body for inserting into central through hole of magnetic field generating component.

12. According to claims 8 or 11, where in the said integrated contact for power switchgear, the said multi-layer cylinder of magnetic field generating component and multi-layer cylinder of conductive component have same layer number.
13. According to claim 1, where in the said integrated contact for power switchgear, the said magnetic field generating component is a layer shape body with one layer or more than one layer.
14. According to claim 1, where in the said integrated contact for power switchgear, the said conductive component is a layer shape body with one layer or more than one layer.
15. According to claims 13 or 14, where in the said integrated contact for power switchgear, layer number of the said magnetic field generating component equals to layer number of the said conductive component.
16. According to claim 1, where in the said integrated contact for power switchgear, he said magnetic field generating component is a layer shape body setting on the said conductive component.
17. According to claim 1, where in the said integrated contact for power switchgear, the said magnetic field generating component is a layer shape body ,the layer is sandwiched between conductive components.
18. According to claim 17, where in the said integrated contact for power switchgear, the said magnetic field generating component is more than one layer.
19. According to claim 1, where in the said integrated contact for power switchgear, the said conductive component and magnetic field generating component are piled layer by layer with one layer or more than one layer, each layer of conductive component combines with magnetic field generating component to define a combination shape coordinated with inner wall shape of container.
20. According to claim 19, where in the said integrated contact for power switchgear, from bottom to top of the said conductive component and magnetic field generating component, each layer area of conductive component is gradually decreased, and corresponding each layer area of magnetic field generating component is gradually increased and each layer of magnetic field generating component has an through open break.
21. According to claims 19 to 20, where in the said integrated contact for power switchgear, each layer of the said magnetic field generating component has different shape of open break.
22. According to claim 1, where in the said integrated contact for power switchgear, the said container can be a cup-like body of rigid material, which melting point is higher than every inside component melting point.
23. According to claim 22, where in the said integrated contact for power switchgear, the said container can be made of rustless steel with melting point higher than 1100 ^{0}C.

24. According to claim 1, where in the said integrated contact for power switchgear, the said arc proof component is a mixture of copper powder and chromium powder.
25. According to claim 24, where in the said integrated contact for power switchgear, ratio of the said mixture of pure copper powder and pure chromium powder can be 10:90 to 90:10.
26. According to claims 24 or 25, where in the said integrated contact for power switchgear, the said pure copper powder is 80 mesh to 400 mesh and pure chromium powder is 80 mesh to 400 mesh.
27. According to claim 26, where in the said integrated contact for power switchgear, the said pure copper powder is 200 mesh to 400 mesh and pure chromium powder is 200 mesh to 400 mesh.
28. According to claim 27, where in the said integrated contact for power switchgear, the said pure copper powder is 325 mesh and pure chromium powder is 325 mesh.
29. According to claim 1, where in the said integrated contact for power switchgear, the said arc proof component is made of sheet or block of copper chromium alloy.
30. According to claim 24,25,26,27,28,or 29, where in the said integrated contact for power switchgear, the said copper material can be substituted by silver material.
31. According to claim 1, where in the said integrated contact for power switchgear, the said conductive component is made of material with electrical conduction, high magnetic resistance and heat conduction.
32. According to claim 31, where in the said integrated contact for power switchgear, the said conductive component is made of copper.
33. According to claim 1, where in the said integrated contact for power switchgear, material state of the said conductive component can be powder, sheet or board, bar, tube or block.
34. According to claim 1, where in the said integrated contact for power switchgear, material state of the said magnetic field generating component can be powder, sheet or board, bar, tube or block.
35. According to claim 1, where in the said integrated contact for power switchgear, the said magnetic field generating component, part or whole, is made of soft magnetic material.
36. According to claim 35, where in the said integrated contact for power switchgear, the said soft magnetic material is electrical iron.
37. According to claim 35 or 36, where in the said integrated contact for power switchgear, state of the said soft magnetic material can be powder, sheet or board, bar, tube or block.

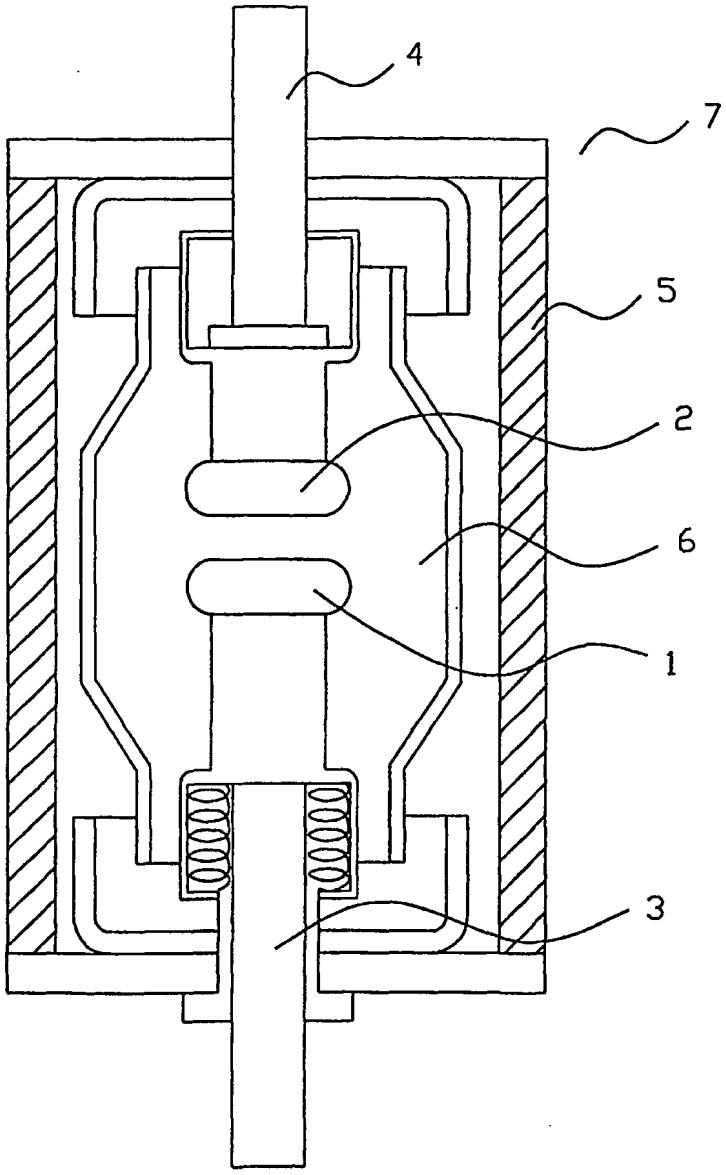


Figure 1

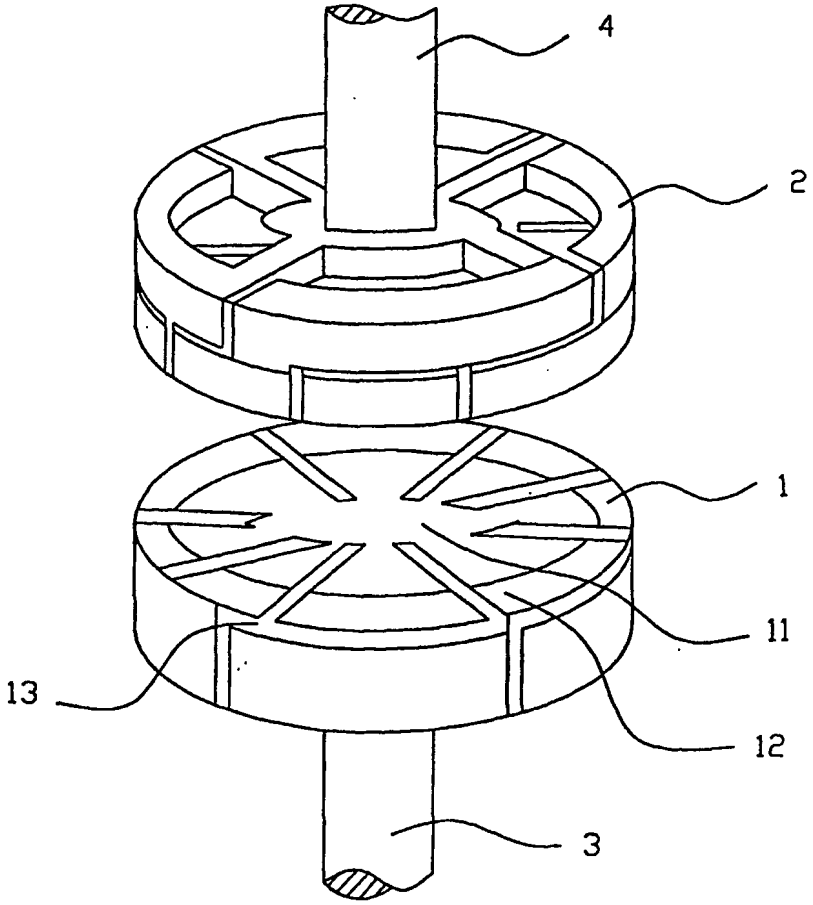


Figure 2

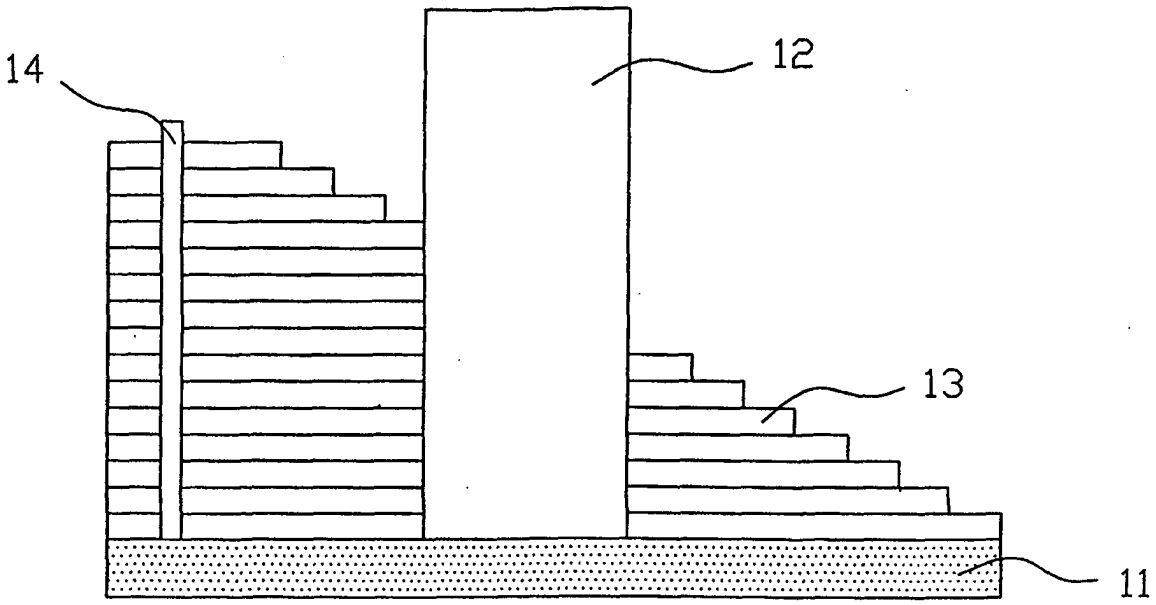


Figure 3

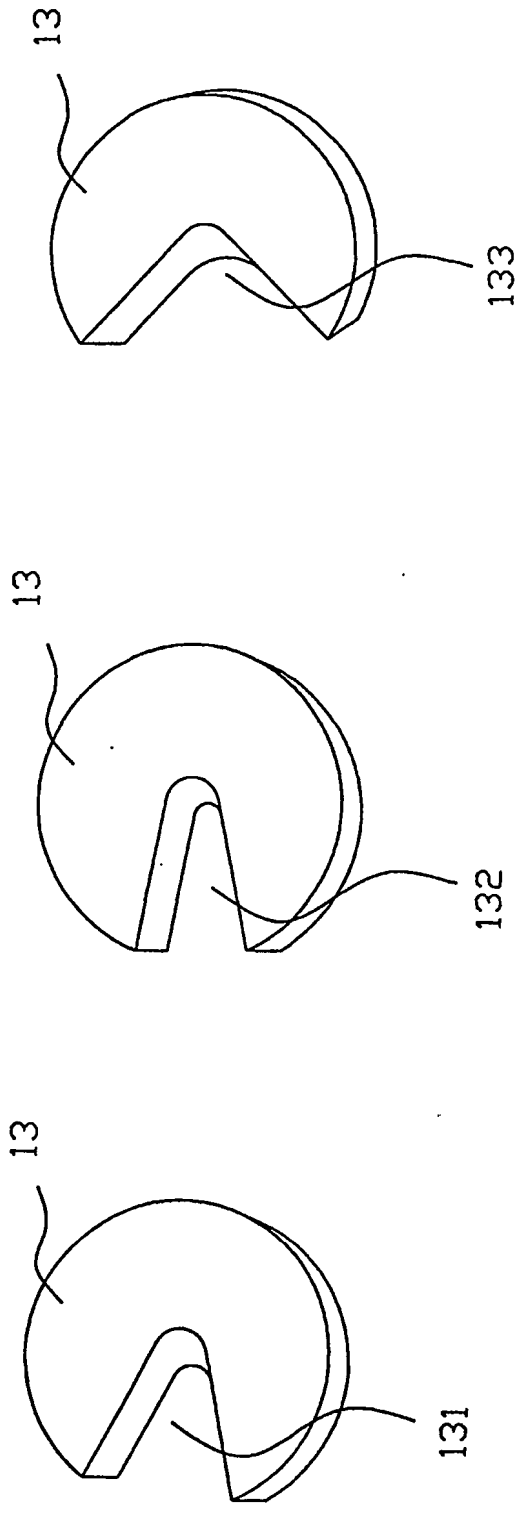


Figure 4

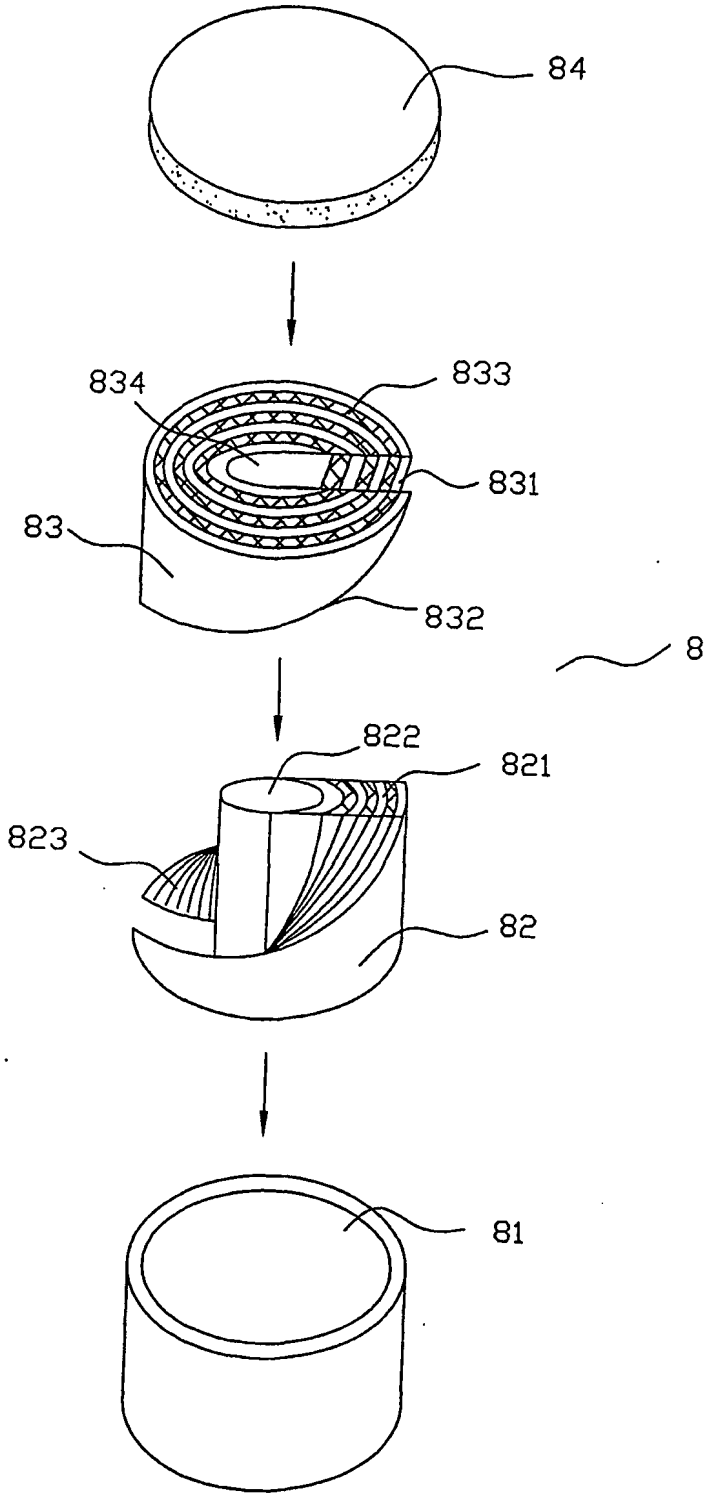


Figure 5

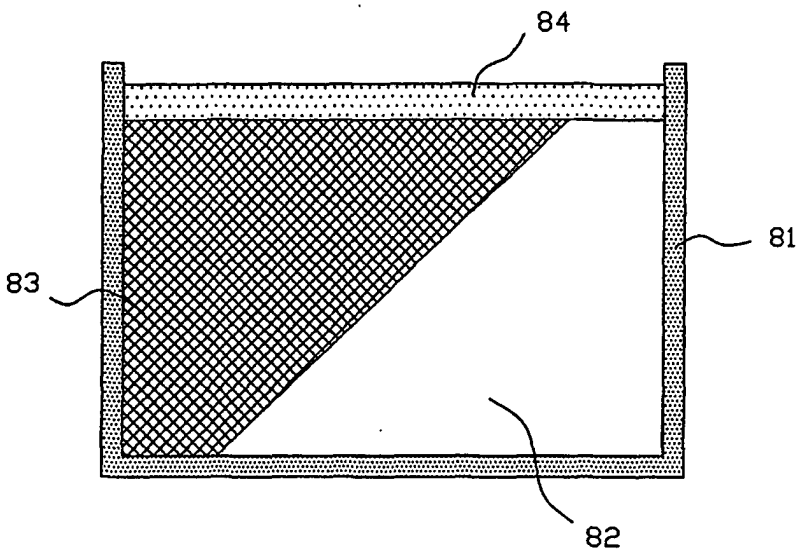


Figure 6

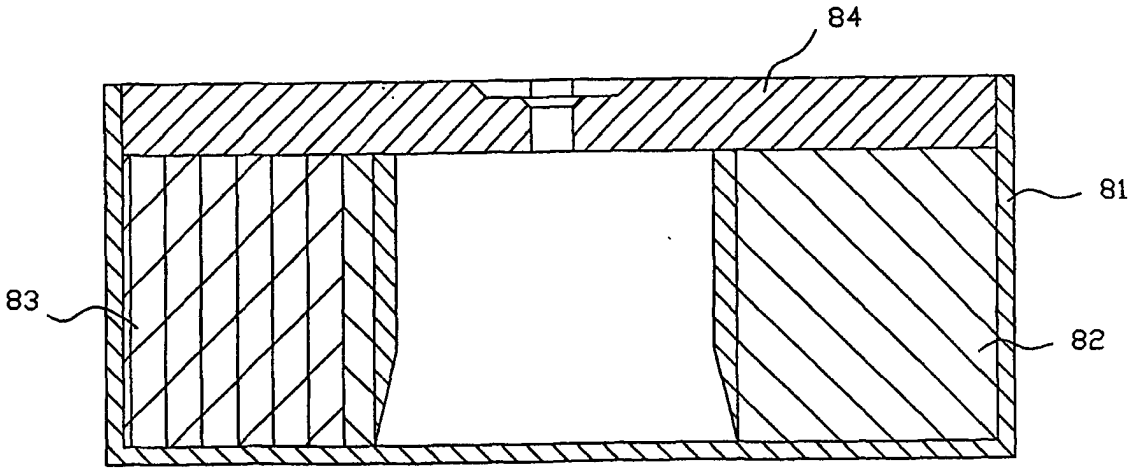


Figure 7

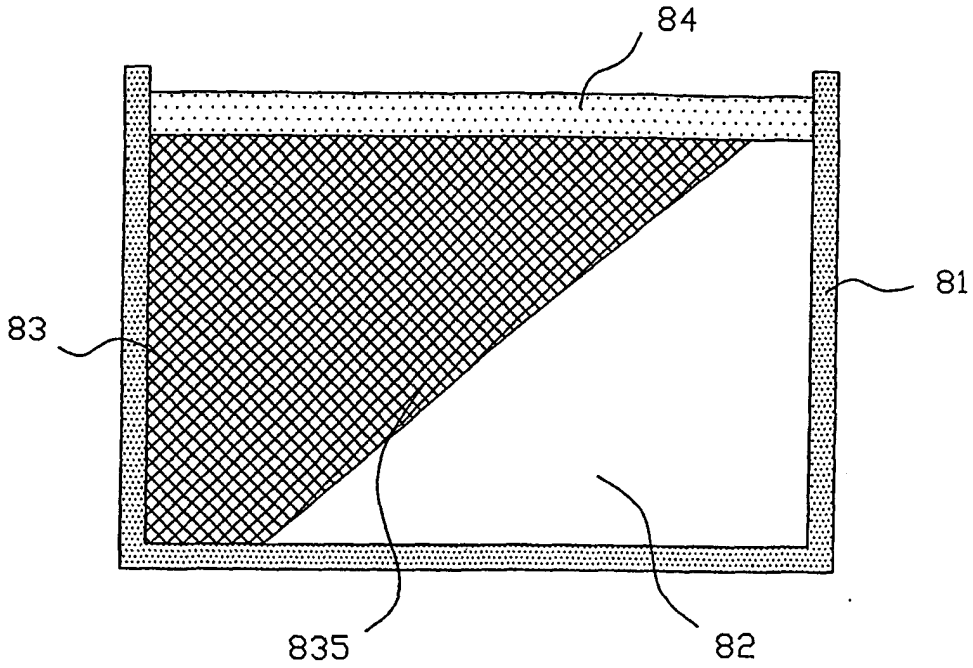
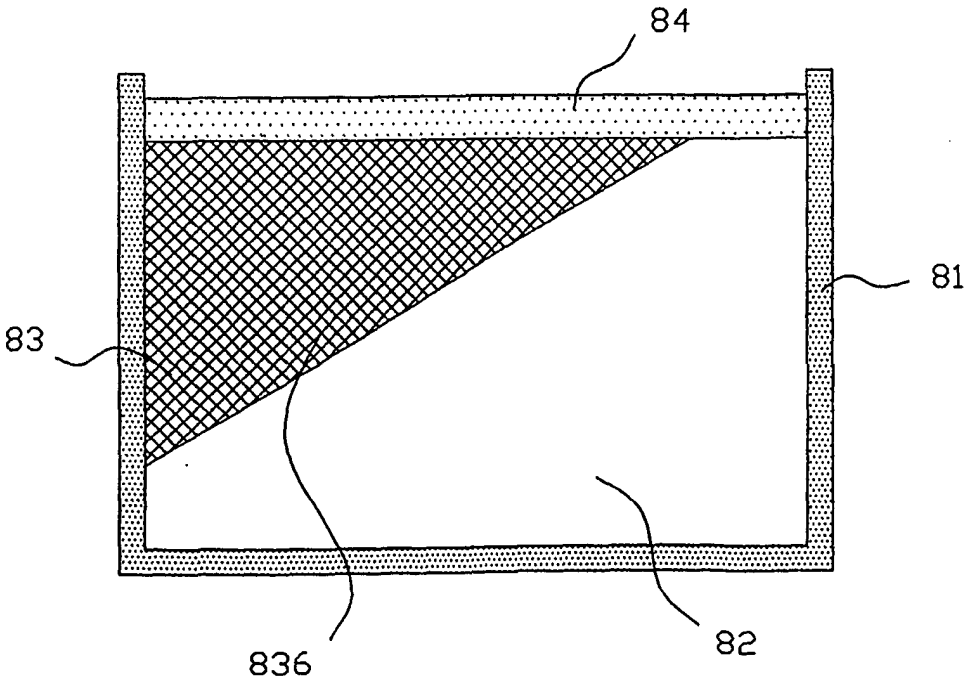


Figure 8



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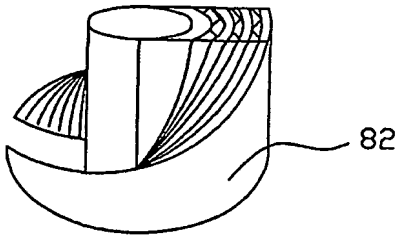

Figure 10

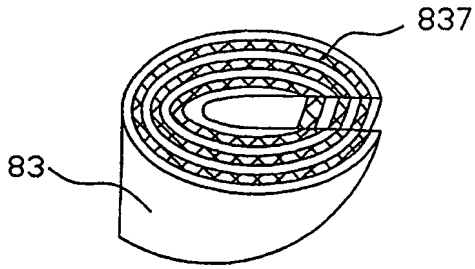

Figure 11

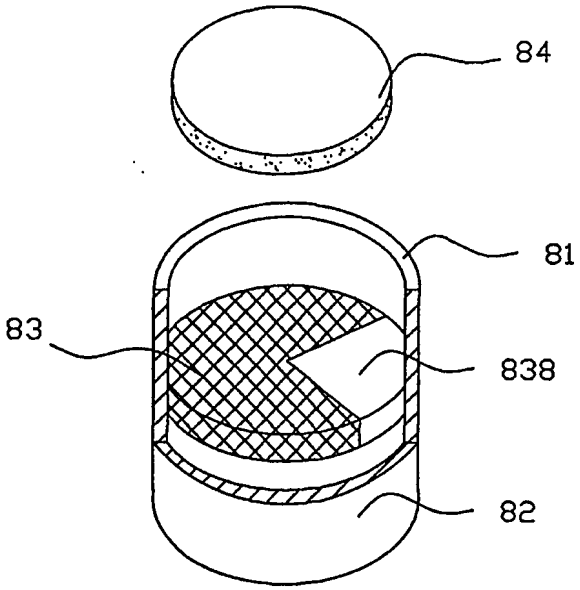

Figure 12

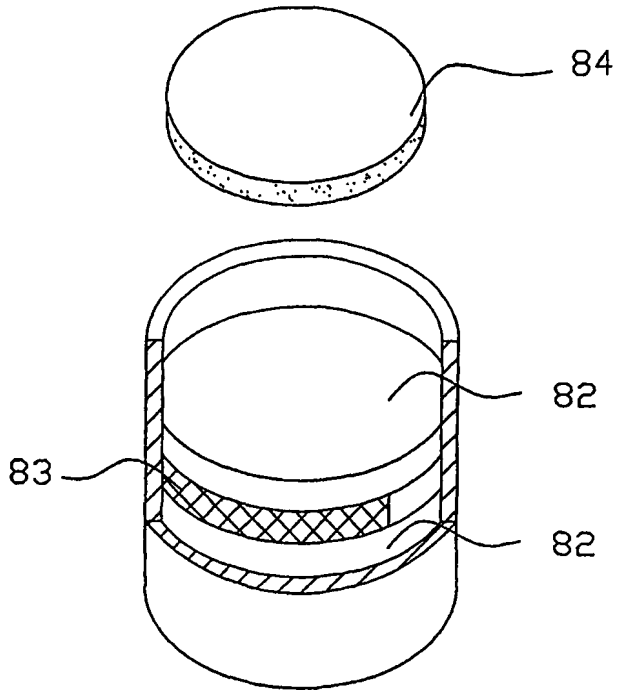

Figure 13

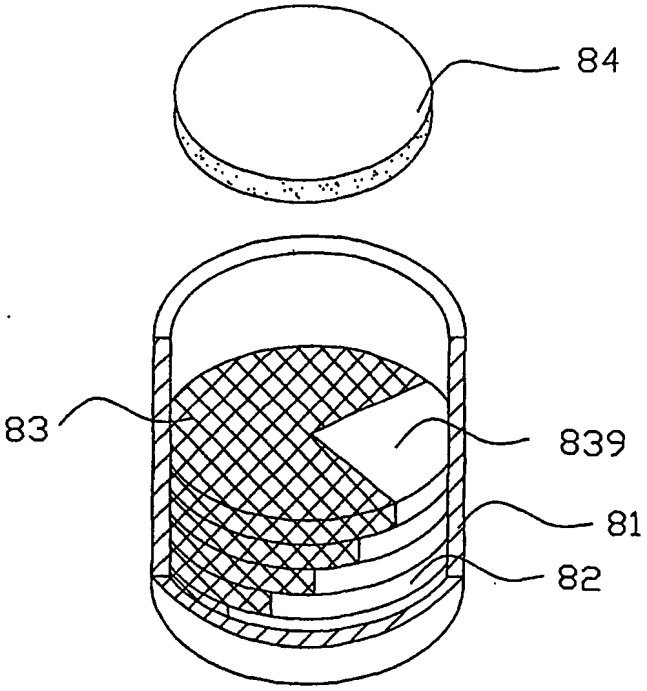

Figure 14

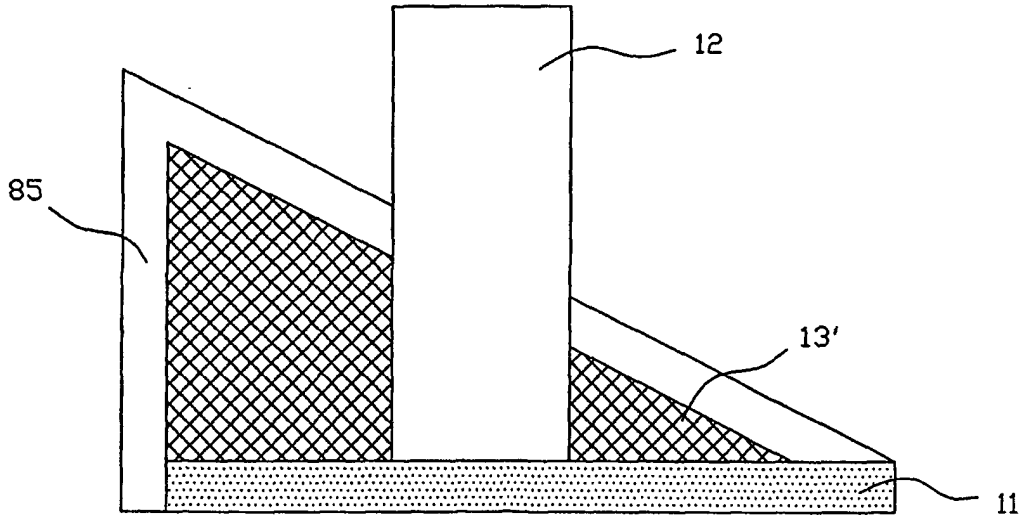

Figure 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN01/01513

A. CLASSIFICATION OF SUBJECT MATTER

IPC[7] H01H 33/664

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC[7] H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0192251 A2 (MITSUBISHI DENKI KABUSHIKI KAISHA), 27 August 1986 (27.08.86), Whole text	1
A	EP 0199594 A2 (VACUUM INTERRUPTERS LIMITED), 29 October 1986 (29.10.86), Abstract, figure 1	1
A	CN 1185644 A (EATON CORP), 24 June 1998 (24.06.98), Abstract, figure 1	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 January 2002 (28.01.02)	07 FEB 2002 (07.02.02)
Name and mailing address of the ISA/CN 6 Xitucheng Rd., Jimen Bridge, Haidian District, 100088 Beijing, China Facsimile No. 86-10-62019451	Authorized officer Zhang Peng Telephone No. 86-10-62093193

Form PCT/ISA /210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN01/01513

Patent document Cited in search report	Publication date	Patent family member(s)	Publication date
EP0192251	1986-08-27	JP61195528	1986-08-29
EP0199594	1986-10-29	GB2174843	1986-11-12
		ZA8603065	1986-12-30
		IN166735	1990-07-14
CN1185644	1998-06-24	EP0849751	1998-06-24
		US5777287	1998-07-07